W. THORNER.

DEVICE FOR LESSENING THE VISIBILITY OF AN OBJECT ON THE WATER.

APPLICATION FILED AUG. 29, 1921.

1,434,167. Patented Oct. 31, 1922.

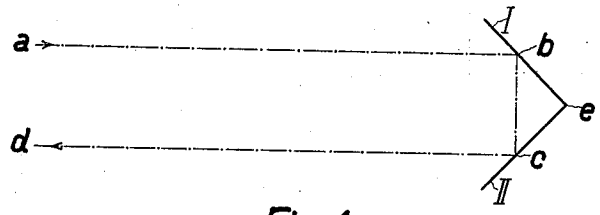


Fig. 1

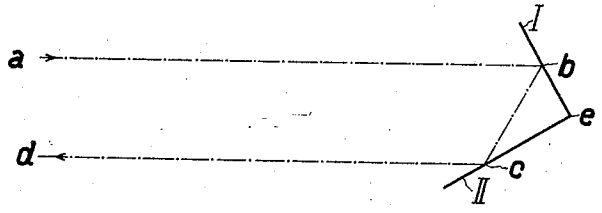


Fig. 2

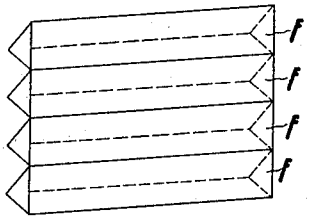


Fig. 3

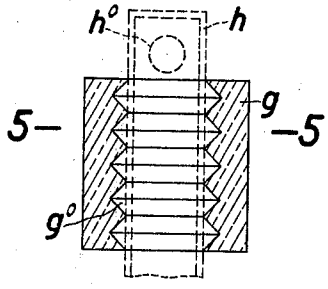


Fig. 4

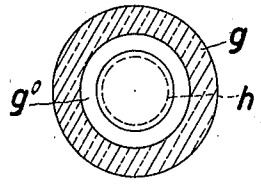


Fig. 5

Inventor:

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UNITED STATES PATENT OFFICE.

WALTHER THORNER, OF BERLIN, GERMANY.

DEVICE FOR LESSENING THE VISIBILITY OF AN OBJECT ON THE WATER.

Application filed August 29, 1921. Serial No. 496,782.

To all whom it may concern:

Be it known that I, WALTHER THORNER, a citizen of the German Empire, and residing at Berlin, Germany, have invented a new and useful Device for Lessening the Visibility of an Object on the Water (for which I have filed an application in Germany January 7, 1915), of which the following is a specification.

In order to render ships as invisible as possible it has been suggested to cover the parts lying above the surface of the water with reflectors which reflect the water or the sky, thus assimilating the ship to the surroundings. However, such devices have not answered well in practice for the following reason. The brightness of the sky is very different by zones; as a rule, it considerably increases from the horizon towards the zenith. If a ship be covered on her surface by reflectors, she generally appears considerably lighter than the surroundings. In order that she really may not stand out against the surroundings, it would be requisite that the reflectors only reflected the horizon. They should therefore all be placed vertically. Although this arrangement can only be carried out technically with difficulty, its effect is entirely suspended by the feature that the ship is continually moved by the sea; hence, owing to her oscillations the ship will alternately appear lighter and darker and thus easily become visible.

The object of the invention is to cover a ship with reflectors in such a way that at all events she only reflects the horizon, no matter how the parts lying above the water are running and independent of her oscillations. This is attained by not using plain reflectors but optical squares, so as to reflect each luminous ray twice. The angular edge of each optical square is in that case placed almost horizontally. Such optical squares are known not to be sensitive to rotations about the line of intersection of the reflectors and, the oscillations of the ship always taking place about horizontal axes, the reflection thus becomes independent of the oscillations of the ship. Besides, such reflectors may cling everywhere to the parts of the ship lying above the water, no matter whether they are inclined upwardly or downwardly, without thereby causing a change in the direction of reflection. As, when looking for ships, the direction of vision of the observer is always almost directed towards the horizon, optical squares having an angle (i. e. a relative inclination of both reflecting surfaces) of 90° are suitably used which may, of course, also be devised as optical square-prisms. It is immaterial for the effect, whether a large optical square be used or the same replaced by a system of small ones.

If the covering of a cylindrical body, e. g. a submarine-periscope comes into question, instead of a polygon of optical squares also rings of these squares may be used. Instead of superposing in that case exact rings of optical squares, a system of superposed rings of optical squares can also be attained by the use of a screw surface (preferably a single one) having a small pitch; the slight amount, by which in that case the angular edge deviates from the above condition, to lie in a horizontal plane, is of no importance.

In the annexed drawing Figs. 1 and 2 diagrammatically show in a vertical section each the path of rays; Fig. 3 shows the combination of several corresponding optical square-prisms to a prism table, Figs. 4 and 5 show in a longitudinal and a cross section each a covering of a submarine-periscope.

In Fig. 1 the light is supposed to emerge from the direction a from a point of the horizon. It strikes at the point b upon the reflector I of an optical square, is reflected upon the point c of the reflector II and returns to the observer in the direction d to another point of the horizon. In that case at each of the two reflectors the angle of incidence is 45°.

Fig. 2 shows the rotation of this optical square about its horizontal angular edge e, as it would take place with oscillations of the ship. The direction of the reflected ray towards d remains the same, although the angles of incidence do not amount any more to 45°.

Fig. 3 shows four rectangular reflecting prisms f combined to a plate. Each of the hypotenusal surfaces serves for the entrance and exit of the rays; the reflecting cathetal surfaces are silvered. Such plates admit, e. g. of covering ships.

In Figs. 4 and 5 g denotes a glass cylinder which is slipped over the top end of a submarine-periscope h below the opening h^0 for the light entrance. The cylinder is provided inside with grooves g^0, the angular

edge of which amounts to 90° and which are silvered. In this way there is formed a number of superposed rings of optical squares in each of which the angular edge lies in a horizontal plane.

I claim:

1. Device for lessening the visibility of an object on the water consisting of optical squares which are fitted to the object and the angular edge of which substantially lies in a horizontal direction.

2. Device for lessening the visibility of an object on the water consisting of optical squares, the two reflecting surfaces of which include an angle of 90°, the said optical squares being fitted to the object and their angular edge substantially lying in a horizontal direction.

3. Device for lessening the visibility of an object on the water consisting of a number of superposed rings of optical squares in which the angular edge substantially lies in a horizontal plane.

WALTHER THORNER.